

Claims

- [c1] 1. A method for acquiring images using a magnetic resonance imaging (MRI) system, the method comprising:
applying a plurality of steady-state free precession (SSFP) radio-frequency (RF) excitation pulses in a selected pattern of varying amplitudes and phases, the pulses having substantially equal spacing between all neighboring pulses and between successive groups of pulses; and,
reading a plurality of signals corresponding to the pulses and wherein the signals are substantially immune to magnetic field inhomogeneity of the MRI system.
- [c2] 2. The method of claim 1 wherein the pattern is three pulses occurring at 90° (x), 180° (-x) and 90° (x), .
- [c3] 3. The method of claim 1 wherein the pattern is three pulses occurring at 90° (y), 180° (x), 90° (-y).
- [c4] 4. The method of claim 1 wherein the pattern is pulses occurring at 90° (y), 180° (x), 180° (x), 180° (x), 90° (-y).
- [c5] 5. The method of claim 1 wherein the pattern is pulses occurring at 90° (y), 180° (x), 180° (-x), 180° (-x), 90° (-y).
- [c6] 6. The method of claim 1 wherein the pattern is pulses occurring at 90° (y), 180° (x), 180° (x), 180° (-x), 180° (-x), 90° (-y).
- [c7] 7. The method of claim 1 further comprising the step of inserting gradient spoiler pulses in a period when magnetization is oriented predominantly in a longitudinal direction.
- [c8] 8. A system for Magnetic Resonance Imaging (MRI) for acquiring images of an object comprising:
a magnetic field driver for driving a field gradient;
a magnetic field controller for controlling the magnetic field;
a transmitter for generating an radio frequency (RF) pulse to cause resonance and wherein the transmitter is adapted to generate a plurality of steady-state

free precession (SSFP) radio-frequency (RF) excitation pulses in a selected pattern of varying amplitudes and phases, the pulses having substantially equal spacing between all neighboring pulses and between successive groups of pulses; and,
a receiver for receiving and detecting magnetic resonance signals generated from the object, the receiver being further adapted to read a plurality of signals corresponding to the pulses and wherein the signals are substantially immune to magnetic field inhomogeneity of the MRI system; and,
a processor for performing image reconstruction and for generating images for display.

[c9] 9. The system of claim 8 wherein the transmitter is adapted to generate the selected pattern having three pulses occurring at $90^\circ (x)$, $180^\circ (-x)$ and $90^\circ (x)$, .

[c10] 10. The system of claim 8 wherein the transmitter is adapted to generate the selected pattern having pulses occurring at $90^\circ (y)$, $180^\circ (x)$, $180^\circ (x)$, $180^\circ (x)$, $180^\circ (x)$, $90^\circ (-y)$.

[c11] 11 The system of claim 8 wherein the transmitter is adapted to generate the selected pattern three pulses occurring at $90^\circ (y)$, $180^\circ (x)$, $180^\circ (-x)$, $180^\circ (-x)$, $180^\circ (x)$, $90^\circ (-y)$.

[c12] 12. The system of claim 8 wherein the transmitter is adapted to generate the selected pattern having pulses occurring $90^\circ (y)$, $180^\circ (x)$, $180^\circ (x)$, $180^\circ (-x)$, $180^\circ (-x)$, $90^\circ (-y)$.